Final Report

Status of the Alabama Cavefish, *Speoplatyrhinus poulsoni*, in Key Cave, Lauderdale County, Alabama

Submitted to:

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and

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Introduction

The Alabama Cavefish, *Speoplatyrhinus poulsoni*, was described by Cooper and Kuehne in 1974 based on nine specimens captured between 1967 and 1970. This species is restricted to Key Cave, Lauderdale County, Alabama, which is located just SW of Florence and just N of the Tennessee River (now Pickwick Reservoir) (Figs. 1 & 2). *Speoplatyrhinus poulsoni* has historically been considered allopatric with the widespread Southern Cavefish, *Typhlichthys subterraneus* (see Fig. 1 for Alabama distributions). The Alabama Cavefish was listed by the U.S. Fish and Wildlife Service (USFWS) as Threatened in 1977 (Federal Register, 1977) and as Endangered in 1988 (Federal Register, 1988). Before 1983, the only information on the of abundance this rare species was from the seven visits to Key Cave to collect the nine type specimens.

Past threats to the recharge area of Key Cave have included sewage sludge application and a proposed landfill (Fig. 2), as well as application of herbicides and pesticides to the abundant cotton fields in the area, which entered the cave through the area's numerous pool seeps. In January 1997 the USFWS purchased 1,054 acres within the recharge area of Key Cave and established the Key Cave National Wildlife Refuge, which is managed by Wheeler National Wildlife Refuge personnel. As of 1 January 1998, all agricultural activities on Key Cave National Wildlife Refuge will restrict chemical use. Gradually, the agricultural land on the refuge will be converted to upland forest and/or native grasslands. These measures should go far towards protecting the aquatic habitat in Key Cave.

Ten years have passed since the status of the Alabama Cavefish was evaluated in the mid-1980's. This report provides a third and final year summary of the results of a survey of the Alabama Cavefish in Key Cave by personnel at The University of Alabama.

Objectives

The objectives of this study were to attempt to determine the current status of *Speoplatyrhinus poulsoni* through visual counts and to examine all waters of Key Cave (Fig. 3) for the presence of Alabama Cavefish.

Methods

During each visit to Key Cave, attempts were made to view specimens in a minimum of the two pools closest to Entrance 2 (Pools A-B, Fig. 4), which are always accessible, even during high water levels. When cavefish were observed, attempts were made to get as close as possible to the specimen for positive identification. When water levels permitted, other bodies of water farther back in the cave (Pools C-F, Fig. 4) were explored for additional specimens.

Results

Cave Conditions.-Key Cave is a multi-level and fairly complex cave with most of the water in its eastern half (Figs. 3 & 4). The cave is inaccessible from April through September due to the presence of a maternal colony of the federally Endangered Gray Bat (*Myotis grisescens*). There was a disturbance of the maternal colony this last summer, with the adult bats relocating to another cave; hundreds of small bat carcasses were observed on the cave floor during our last visit (21 October 1997), presumably as a result of the disturbance.

All cavefish observed to date have been in the eastern half of the cave. Pool A is closest to the cave entrance (Fig. 4) and has a main channel about. 1.5 m wide and 15 m long, water depth to 5 m, and the water surface is from 1-2 m below the rock ledge. There is a long steep slope of guano above the pool which one must climb down to reach the observation area. This quite often leads to an "avalanche"

of guano, which disturbs the water and potentially any cavefish present. On each visit to this pool, however, every effort is made to minimize disturbances to the cavefish. During low water conditions no current is discernible, but during high water a current flows from the shallow end of the main pool, and a normally dry side pool exhibits some upwelling.

Pool B (Fig. 4) is at the bottom of a long, narrow passage. The pool is about. 15 m long, and at the shallow end the rock ledge is about. 3 m above the water surface. After traversing a large boulder and approaching the middle of the pool, the ledge is 1.5 m above the surface, and the pool is 1 m wide and 2 m deep. A side pool less than 0.5 m wide is present here. There is no ledge, hence no access, to the last half of the pool, where the water is about 5 m deep.

Pool C (Fig. 4) lies in a floorless, fairly narrow passage with high ceilings and angled walls which almost converge under the water surface. There is a thin sheet of rock stretching from wall to wall in part of the passage about. 1.5 m above the water surface. Access to this pool is limited to placing both feet on one wall and both hands and back on the other, and "walking" down the passage above the pool. The pool depth is unknown due to the lack of visibility below the small openings where the walls almost converge below the water's surface.

Access to waters farther into Key Cave is limited to low water conditions, as the far end of the Step Across passage (Pool C, Fig. 4) is impassable during high water. A total of five expeditions beyond this passage have been undertaken during the three years of this study (Pools D, E, and F are beyond this passage). The first of these remote pools (Pool D, Fig. 4) is also floorless, and must be navigated in the same difficult manner as mentioned above. This pool has a mostly flat bottom about. 1.5 m deep. There is a passage off to one side that appears to continue underwater. This passage has short ceilings and the walls are very close together, resulting in difficult maneuvering in this area.

An extensive stomach crawl through a 1 foot-tall passage with floors of mud and shallow water lead to Pool E (Fig. 4), which is a small (3 x 4 m), 0.5 m deep pool at the bottom of a 15 foot deep pit. As in other pools, there is a passage continuing off the back of this pool that continues underwater.

Pool F (Fig. 4) is also at the end of a very small and muddy passage. This pool is very deep (depth unknown) and circular in shape, with a width of about. 7 m and sheer walls around both sides, making access to the other side of the pool impossible without swimming. Unlike all of the above mentioned pools, no crayfish or cavefish have ever been observed in this pool or in any other waters in this section of the cave. It is not known whether Pool F is connected to other waters in Key Cave. The other bodies of water in this immediate area (including Lynny's Pool, Fig. 4) all appear to be isolated drip pools with no underwater connections. While only surveyed once, water in these pools was extremely clear and devoid of any visible aquatic life.

During the third year of this study, we have explored the first one-third of the western half of the cave (Fig. 5). This section of the cave is even more difficult to maneuver than the eastern half. Passages are extremely small, curving, and muddy. Three different pools were examined, the largest being Pool H (Fig. 5). All pools lacked any cavefish or cave crayfish, and the water was extremely clear at a time when waters containing cavefish were cloudy. We believe these pools are isolated drip pools and are not connected to waters containing aquatic cave species. Several pools in the last one-third of the western half of Key Cave remain to be surveyed for potential habitats and Alabama Cavefish.

Status Determination.-Historically, Pools A and B (Fig. 4) are the two bodies of water that have been examined for Alabama Cavefish. A total of 25 separate trips to one or both of these pools have occurred over the last 30 years (Table 1). In an

endangered species symposium 6-7 March 1975 at the University of Alabama, John E. Cooper reported on seven trips into Key Cave during 1967-70, when the type series was collected (Table 1). Only Pool A was visited, and the number of cavefish observed ranged from none to three individuals. Richard M. Cobb, in a correspondence to the USFWS, reported on 12 visit to both Pool A and B during 1985-86, where he observed two to nine cavefish per visit (Table 1). From 1992-97, we surveyed both pools six times, and saw from a minimum of no cavefish to a maximum of three to six individuals per visit (Table 1). The range of three to six cavefish results from the possibility of recounting the same individuals. During these three separate time period (1967-70, 1985-86, 1992-97) (Table 2, first three rows of data) the number of trips where at least one specimen of Alabama Cavefish was observed ranged from all visits (12) to two-thirds of the visits (4 of 6). The mean number of Alabama Cavefish observed per trip was highest in 1985-86 with 4.6 individuals. Lower values were recorded in 1967-70 (1.3) and 1992-97 (1.7-2.7).

Pools A, B, and C (Fig. 4) were visited by us in 1995, and we observed no cavefish on one visit, and only one cavefish during the other four trips (Table 1). The fourth row of data in Table 2 shows the very low mean number of cavefish per trip (0.8); this may be a reflection of the extremely high water that was present on each of these trips.

Six surveys of four or more pools in Key Cave have occurred; once in 1983 by USFWS personnel and five times by us in 1995-96 (Table 1). The 1983 expedition, outlined in an intra-agency correspondence by James H. Stewart of the USFWS, observed a total of 10 specimens in six different pools (Pools A-D, F, and G) (Fig. 4); Pool G is no longer present, it is now just a hole in the cave floor. Although all of the recent trips (1995-96) have surveyed only four or five pools, the mean number of Alabama Cavefish observed (7.8 to 8.4) is comparable to the 1983 junket (Table 2, last two rows).

Although the number of observed Alabama Cavefish was higher in the 1980's, all of the data indicate that the population appears to have been relatively stable over the last three decades. This is the best determination that can be made with the extremely limited amount of data available for this highly inaccessible fish.

It appears that recruitment is occurring, as we have observed at least three size classes of Alabama Cavefish present in Key Cave. The larger size class is about. 40-50 mm SL, the middle class about. 30 mm SL, and the smaller individuals are about. 15-20 mm SL.

Mark and Recapture Protocol.-In any mark and recapture program, collection of specimens is mandatory. We have been able to net only three specimens of the Alabama Cavefish in 14 separate visits to Key Cave. During the third year of this study no capture attempts were made. The habitat these cavefish occupy is generally inaccessible, and the cavefish are very sensitive to any water movements.

We have tried using minnow traps baited with pieces of crayfish, brine shrimp, and artificial fish attractants, all producing no cavefish. Until a method is established for capturing and recapturing specimens, the possibility of any accurate estimation of population size is limited.

Sympatric Cavefish Species.- The Alabama Cavefish differs from the Southern Cavefish by having unbranched rays and incised membranes in the caudal fin (Fig. 6A). The more obvious character that separates these two species is head shape. The Alabama Cavefish has a more laterally constricted head that is elongate and tapers into a snout, whereas the Southern Cavefish possesses a large, broad head that is rather blunt (Fig. 6B). When viewing these two species from above within Key Cave, the different head shapes allow us to distinguish between the two species (Fig. 7)

The Southern Cavefish, *Typhlichthys subterraneus*, was never been observed in Key Cave until we collected a specimen in January 1995. This 60 mm SL specimen was netted in Pool B, a fin clip was removed, and the specimen was released. We do not know if this specimen represents a recent invasion of this species into Key Cave, or if this species has always occurred in low numbers in sympatry with the Alabama Cavefish. We have seen the presumed same individual (that was fin clipped) over the last two years in Pool B on three other occasions and once in pool A, indicating that this fish is resident in this area of Key Cave and that there is at least one underwater passage connecting these two pools.

Previous survey studies searching for additional populations of *Speoplatyrhinus poulsoni* in northern Alabama considered this species missing if *Typhlichthys subterraneus* was know to inhabit the cave, and thus several caves with cavefish know to be present were not surveyed for Alabama Cavefish. This reasoning now appears flawed, and we would like to survey caves in the area with known populations of Southern Cavefish, as well as other unsurveyed caves with appropriate habitat for Alabama Cavefish.

Literature Cited

Cooper, J. C., and R. A. Kuehne. 1974. *Speoplatyrhinus poulsoni*, a new genus and species of subterranean fish from Alabama. Copeia 1974(2): 486-493.

Federal Register. 1977. Final threatened status and critical habitat for five species of southeastern fishes. Vol. 42, No. 175, Part V (9 September 1977):45526-45530.

Federal Register. 1988. Reclassification of the Alabama cavefish from threatened to endangered. Vol. 53, No. 188, Part IV (28 September 1988):37968-37970.

Table 1. Author of account detailing data on Alabama Cavefish, with date and number of Alabama Cavefish observed in Key Cave for various combinations of pools visited. See text for Pool locations in Key Cave.

Author	Date	# of Fish
	Pool A and/or Pool B visited	
Cooper		
	18 March 1967	1
	1 April 1967	3
	27 April 1967	3
	20 March 1968	1
	July 1969	0
	April 1970	0
	24 May 1970	1
Cobb		
	6 November 1985	4
	16 November 1985	2
	23 November 1985	9
	14 December 1985	5
	21 December 1985	4
	28 December 1985	3
	4 January 1986	8
	18 January 1986	5
	25 January 1986	2
	28 March 1986	3
	22 February 1986	2
	7 September 1986	8
Kuhajda & Mayden		
	14 October 1992	3-6
	16 February 1993	3
	6 December 1993	0
	25-26 January 1995	1
	16 December 1996	1
	21 October 1997	3-6

Table 1. Continued.

Author	Date	# of Fish
	Pools A-C visited (high water)	
Kuhajda & Mayden		
	25 January 1995	1
	18 February 1995	1
	25 February 1995	1
	5 March 1995	0
	16 March 1995	1
	At least 4 pools (A-G) visited	
Stewart		
	17 November 1983	10
Kuhajda & Mayden		
	2 February 1995	10-12
	12 February 1995	7
	25 January 1996	5
	29 September 1996	8-9
	18 November 1996	9

Table 2. Number of trips into Key Cave and number of Alabama Cavefish observed during various time periods, with a mean number of cavefish observed per trip. Data divided into number of pools visited to standardize comparisons.

Year	Trips	Trips w/ Fish	# of Fish	Mean/Trip
1 or 2 pools visited				
1967-70	7	5	9	1.3
1985-86	12	12	55	4.6
1992-97	6	4	10-16	1.7-2.7
3 pools visited - high water				
1995	5	4	4	0.8
At least 4 pools visited				
1983	1	1	1	10.0
1995-96	5	5	39-42	7.8-8.4

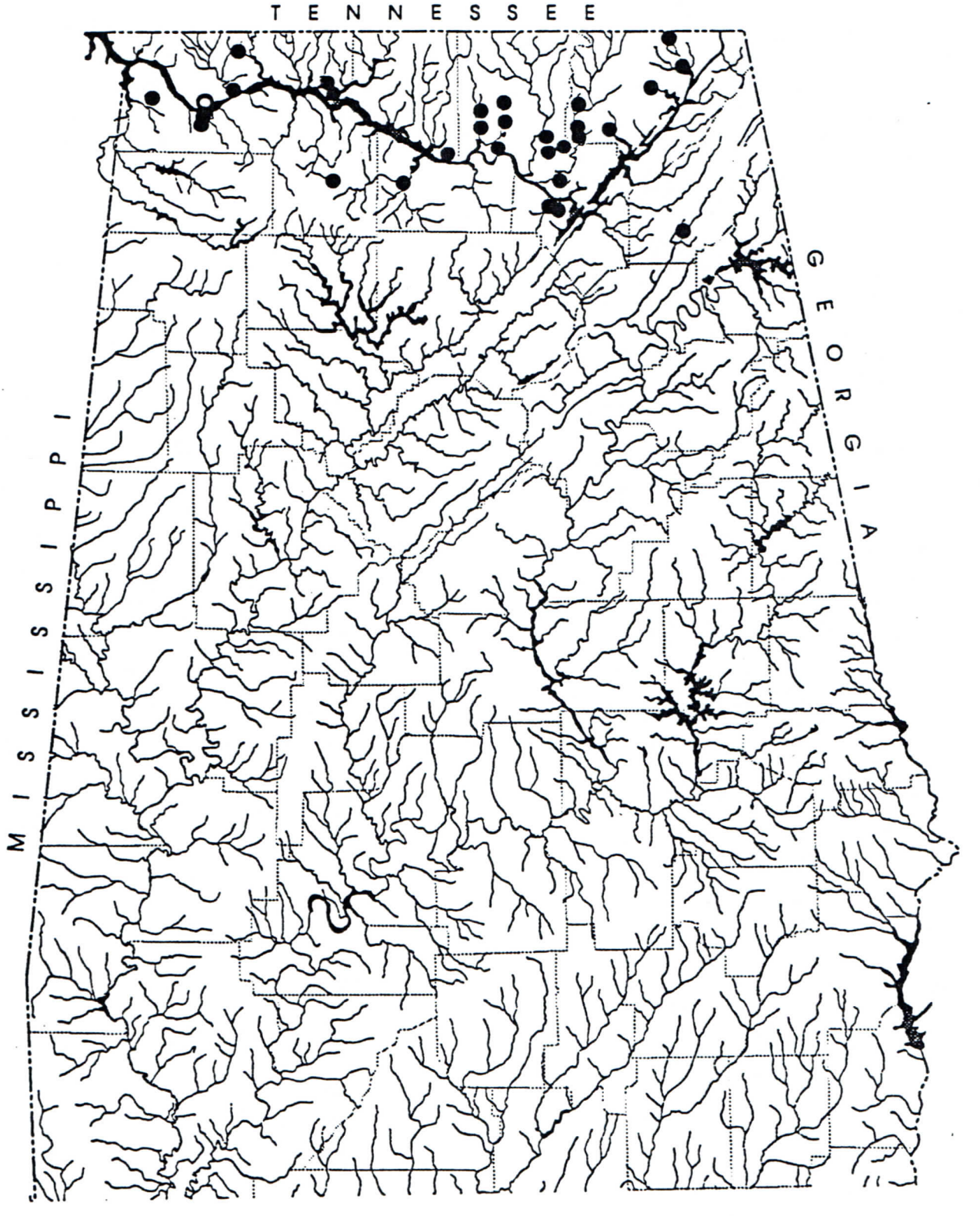

Figure 1. Distribution of the Alabama cavefish (open circle) and the southern cavefish (closed circles) in Alabama.

Figure 2. Key Cave and its recharge area, including past threats.

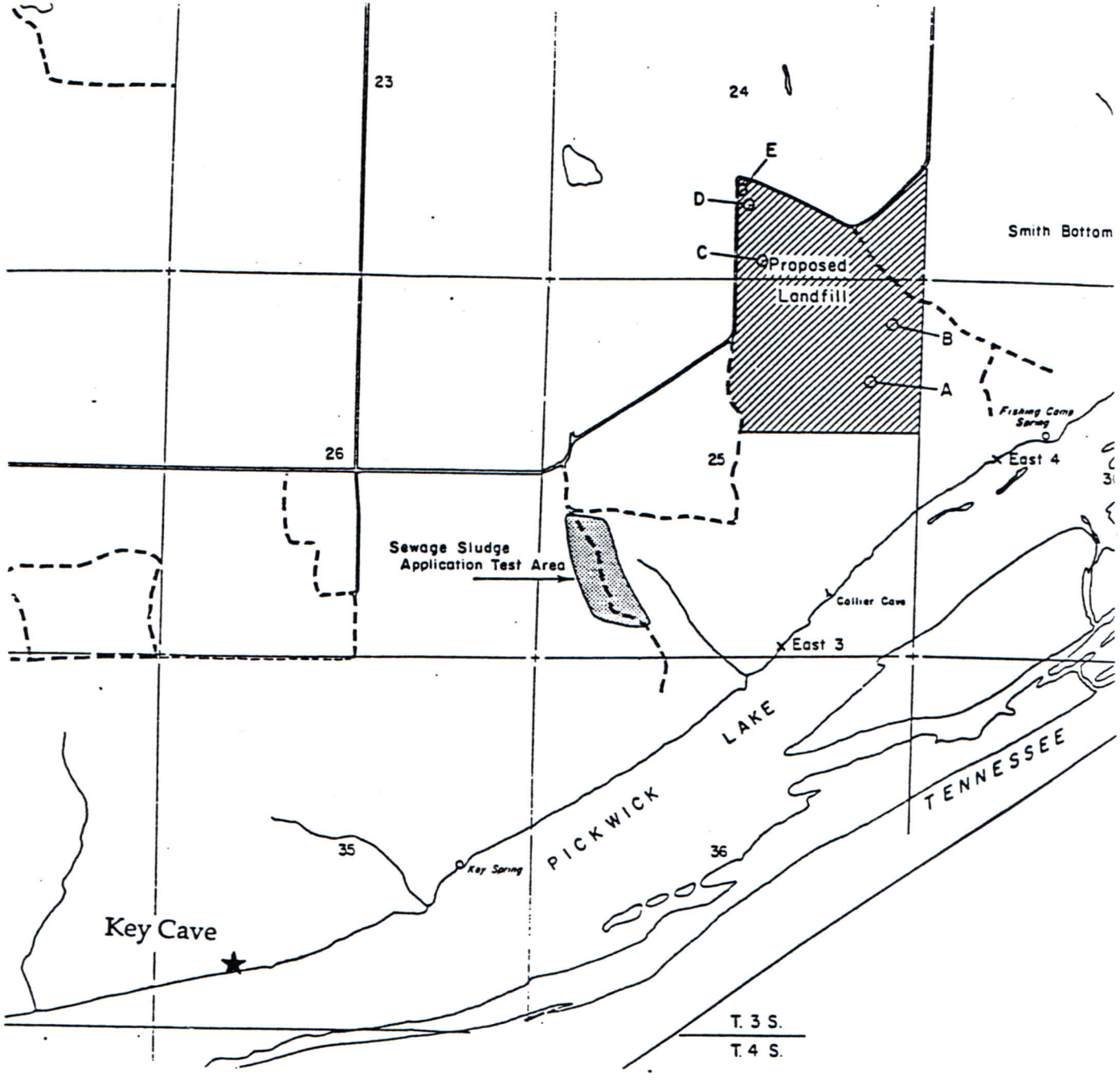

Figure 3.

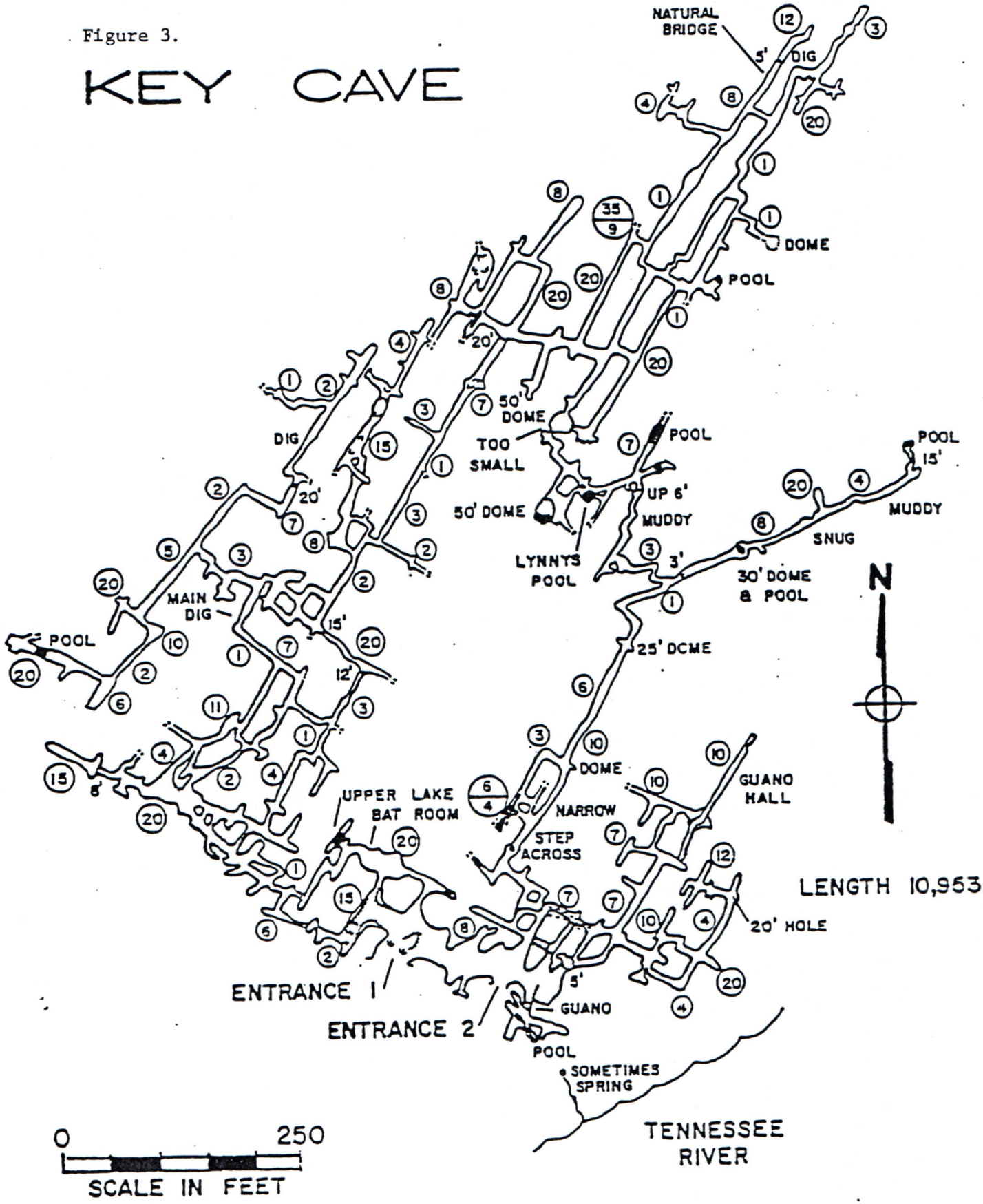
KEY CAVE
NATURAL BRIDGE
5'
DIG
DOME
POOL
50' DOME
TOO SMALL
POOL
POOL 15'
MUDDY
SNUG
UP 6'
MUDDY
50' DOME
LYNNYS POOL
3'
30' DOME & POOL
DIG
20'
MAIN DIG
15'
POOL
12'
25' DOME
DOME
GUANO HALL
UPPER LAKE
BAT ROOM
NARROW
STEP ACROSS
20' HOLE
LENGTH 10,953
N
ENTRANCE 1
ENTRANCE 2
5'
GUANO
POOL
SOMETIMES SPRING
TENNESSEE RIVER
0
250
SCALE IN FEET

Figure 4. Enlargement of eastern half of Key Cave showing pools A-G.

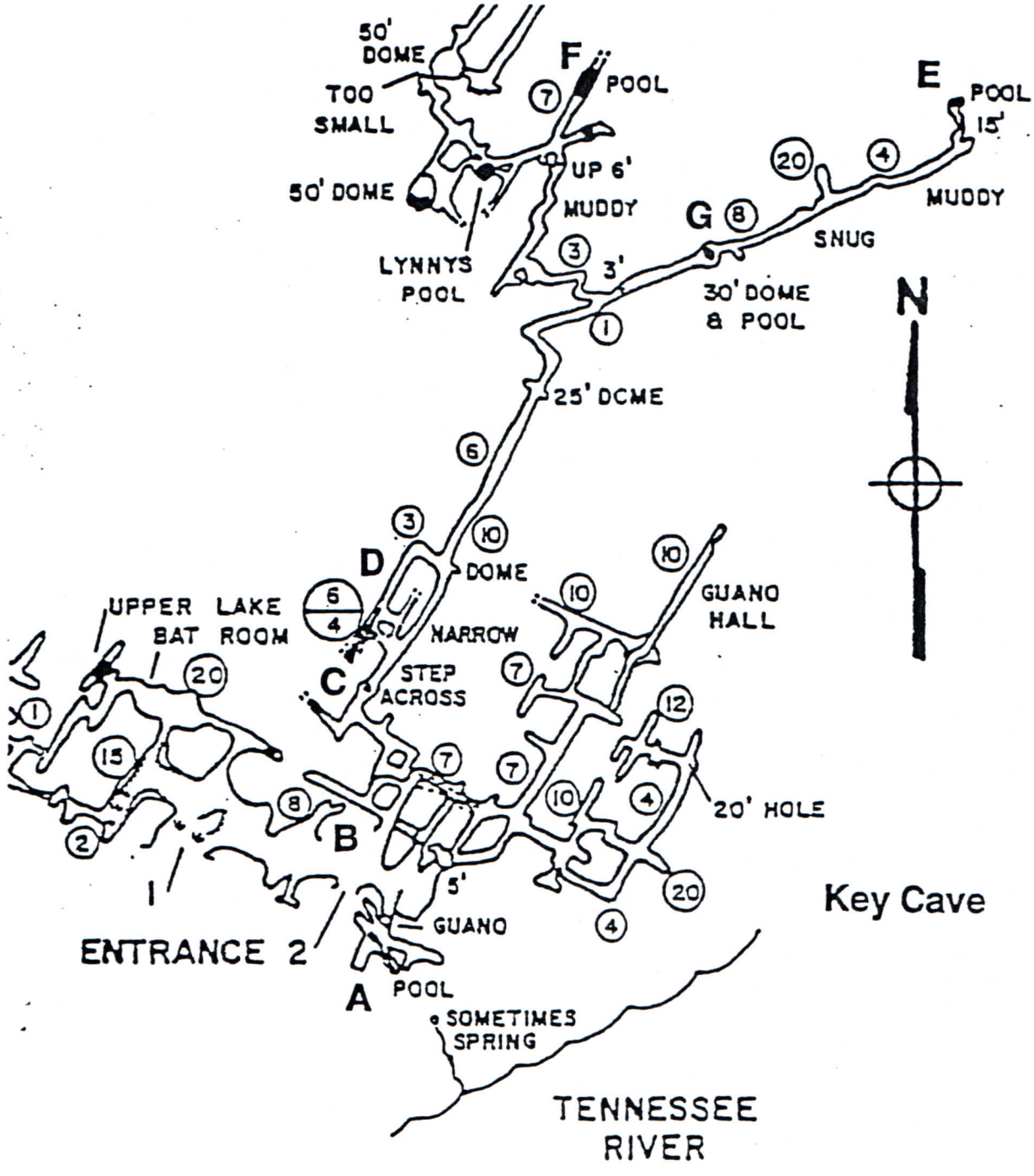

Figure 5. Enlargement of western half of Key Cave showing pool H.

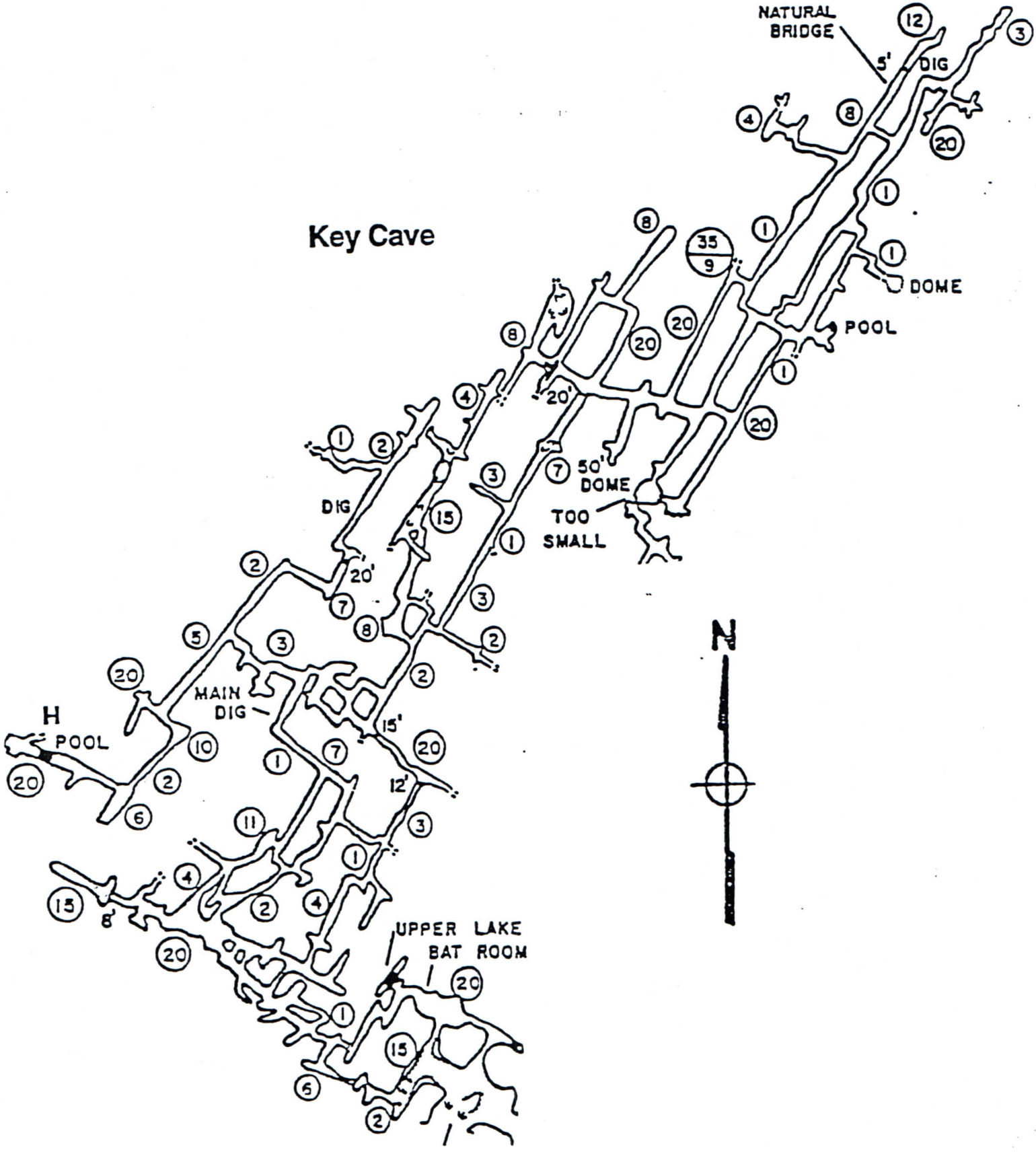

Figure 6. Caudal fin (A) and head (B) illustrations of Speoplatyrhinus poulsoni and Typhlichthys subterraneus. Figures from Cooper and Kuehne, 1974.

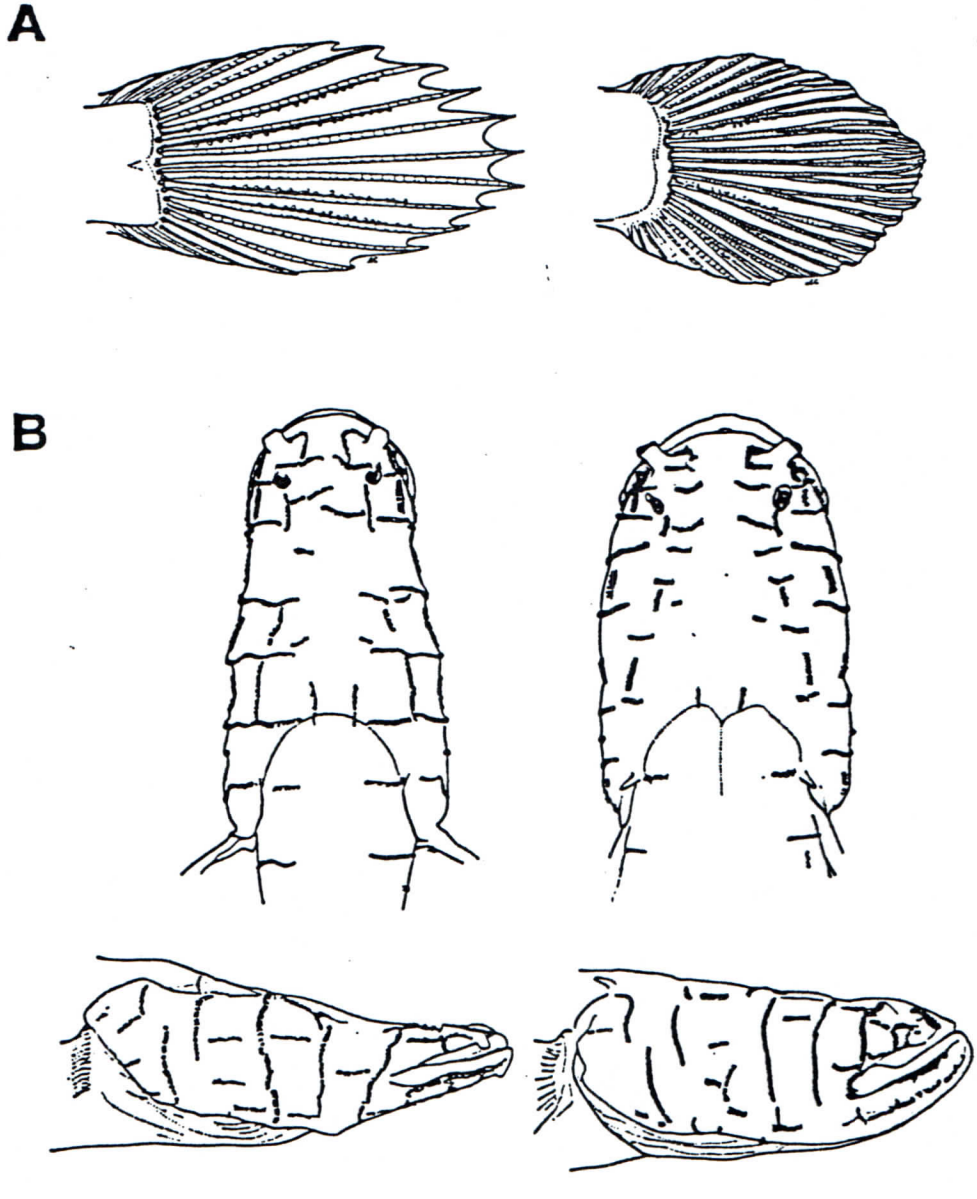

Figure 7. Dorsal view of (A) Speoplatyrhinus poulsoni and (B) Typhlichthys subterraneus showing general body shape. Figure from Cooper and Kuehne, 1974.